International Journal of Economic Research and Financial Accounting

International Journal of Economic Research and financial Accounting (IJERFA)
Volume 4, Number 2, January 2026, Page. 296 - 304 **E-ISSN: *2964-1977***

Causality Analysis Of Human Developman Index On Economic Growth To Support SDGs In South Sulawesi

Erwinsyah[1)], Diah Retno Dwi Hastuti [2)], Sri Astuty[3)], Abdul Rajab[4)], Irwandi[5)]
[1,2,3,4,5)] Faculty of Economics & Business, UniversitasNegeri Makassar, Indonesia

[*]Coresponding Author
Email : Erwinsyah4545@gmail.com

Abstract

This quantitative study analyzes the causality and cointegration between the Human Development Index (HDI) and Economic Growth (EG) in 10 Regencies/Cities in South Sulawesi during the 2015-2024 period, supporting the achievement of SDGs. Using the Granger Causality Test and VECM, the results reveal a long-term cointegration between EG and all HDI components (LE, AYS, PCE). Causality analysis indicates a strong Two-Way Causality relationship between HDI, AYS, and PCE on EG. Conversely, a One-Way Causality exists from EG to LE. The findings conclude that while Economic Growth acts as the main short-term adjuster, sustained investment in human quality, especially education and purchasing power, is crucial as the primary capital for achieving stable and sustainable economic development in South Sulawesi.

Keywords: Economic Growth, Human Development Index (HDI), Granger Causality, South Sulawesi.

INTRODUCTION

The Sustainable Development Goals (SDGs), or Global Goals, were established by the United Nations in 2015 as a worldwide initiative aimed at ending poverty and ensuring peace and well-being for all by the year 2030. The 17 goals are mutually linked, acknowledging that progress in one sector influences results in others, and emphasizing that sustainable development requires a balanced approach across social, economic, and environmental dimensions.

Among the 17 Sustainable Development Goals (SDGs), the Human Development Index (HDI) has strong relevance to several of them. Enhancing HDI contributes to the realization of SDG 3 (Good Health and Well-Being), which aims to ensure healthy lives and promote well-being for people of all ages. It is also connected to SDG 4 (Quality Education), as education is a crucial pillar in improving human capital and workforce quality. In addition, HDI is aligned with SDG 8 (Decent Work and Economic Growth), which highlights the need for inclusive and sustainable economic growth to elevate overall societal welfare(Azwardi&Sukanto, 2024).

Indonesia, as a nation that has pledged to adopt the Sustainable Development Goals (SDGs), demonstrates its commitment through various strategic initiatives aimed at supporting their achievement. This commitment is formalized in Presidential Regulation No. 59 of 2017 regarding the implementation of the SDGs. To oversee and coordinate these efforts, the government has also formed a National SDG Secretariat tasked with ensuring that the goals are effectively realized throughout the country(BAPPENAS, 2020).

Human development and economic growth are two fundamental aspects in achieving social well-being. The Human Development Index is a key indicator for measuring a region's quality of life, encompassing aspects of health, education, and a decent standard of living. Meanwhile, economic growth reflects a country or region's productive capacity to generate income and well-being for its population. Both are interconnected in a sustainable development cycle, where improving the quality of human resources can accelerate economic growth, while

International Journal of Economic Research and Financial Accounting

International Journal of Economic Research and financial Accounting (IJERFA)
Volume 4, Number 2, January 2026, Page. 296 - 304 E-ISSN: 2964-1977

stable economic growth provides greater opportunities to improve the quality of life (Nurjannah et al., 2023).

In Indonesia, each region faces its own challenges in improving the welfare of its population, depending on geographic, social, and economic factors. One province experiencing rapid economic growth is South Sulawesi. South Sulawesi Province is driven by the rapidly expanding industrial, trade, and service sectors, particularly in Makassar, the regional economic center (Pratiwi et al., 2024). Some regions, such as Gowa and Bantaeng Regencies, with better infrastructure and access to public services, have seen significant improvements in education and health care, while other regions, particularly those still reliant on primary sectors like agriculture and fisheries, face challenges in improving the quality of their human resources. Differences in access to quality education and adequate health care are among the main factors causing this inequality (Ringga & Silvia, 2024).

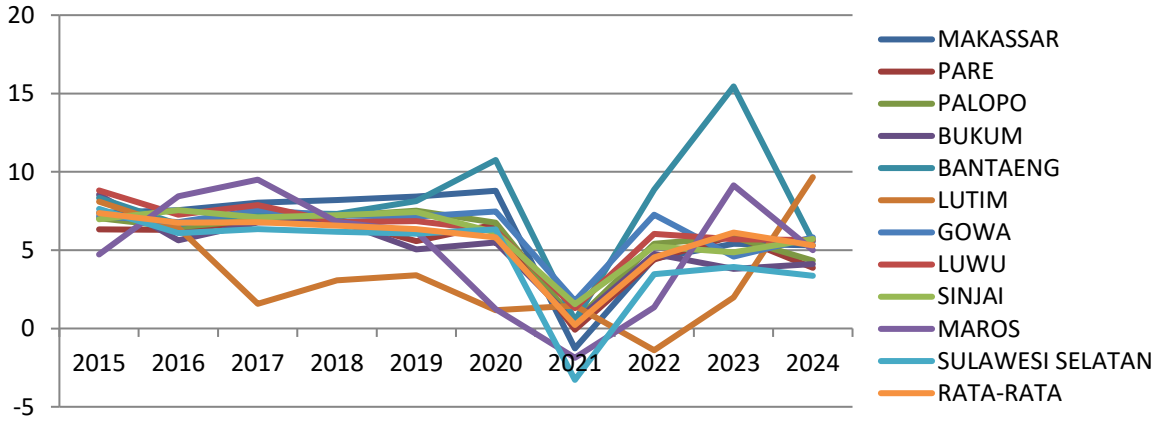

Figure 1. Economic Growth Rate of Districts/Cities in South Sulawesi 2015-2024
Source: BadanPusatStatistik 2025, Data Proceed

Figure 1 above shows that regional economic growth from 2015 to 2024 shows three main patterns: positive stability before 2020, a sharp and simultaneous contraction in 2021 due to the pandemic, and a post-pandemic recovery phase (2022-2024) marked by significant disparities. Although most regions returned to growth in the range of 2% to 5%, one region achieved an extreme growth surge (above 8%) in 2023. This data highlights the increasingly striking imbalance in regional economic performance after the pandemic period.

The Human Development Index plays a crucial role in modern economic development because good human development maximizes the utilization of production factors. A high-quality population enables innovation and development of existing production factors. Furthermore, high human development results in a high population, which in turn increases consumption levels. This drives economic growth. However, in South Sulawesi Province, the Human Development Index has increased annually, but economic growth remains volatile (Nurma, 2025).

The biggest development challenge in South Sulawesi is ensuring that economic growth is not only reflected in GRDP (Gross Regional Domestic Product) but also has a direct impact on improving the quality of life of the community. Many communities still rely heavily on the primary sector, which has relatively low productivity, so its contribution to GRDP growth remains limited. A more inclusive economic transformation is needed so that economic growth

International Journal of Economic Research and Financial Accounting

International Journal of Economic Research and financial Accounting (IJERFA)
Volume 4, Number 2, January 2026, Page. 296 - 304 E-ISSN: 2964-1977

can provide broader benefits to all levels of society, particularly in improving the quality of education and health in underdeveloped areas (Shantika & Sunoto, 2025).

Therefore, this study is motivated by the interest in examining the bidirectional relationship between the Human Development Index and Economic Growth across 10 regencies and cities in South Sulawesi during the period 2015–2024. The purpose of this research is to analyze how HDI and economic growth are related within the province, as well as to identify whether there is a long-term cointegration between the two variables in all regencies/cities of South Sulawesi.

RESEARCH METHODS

This quantitative research aims to investigate the relationships between the variables studied. The data used in this study are secondary data from the Indonesian Central Bureau of Statistics. This study utilizes five data sets: Gross Domestic Product, Human Development Index, Life Expectancy, Average Years of Schooling, and Per Capita Expenditure, covering the period 2015-2024.

To achieve this objective, the study begins by analyzing the causal relationships between Economic Growth, Human Development Index, Life Expectancy, Average Years of Schooling, and Per Capita Expenditure. This analysis does not predetermine the dependent and independent variables. The systematic stages of data analysis include unit root testing (data stationarity), determining the optimal lag length, cointegration testing, model stability testing, and causality testing using the Granger causality test. Data analysis was performed using EViews 12 software to obtain statistically accurate results.

Model specification

In this study, the model used to test the Human Development Index, Life Expectancy, Average Years of Schooling, and Per Capita Expenditure on Economic Recovery in South Sulawesi uses panel data. The Granger causality equation model in this study can be derived as follows:

$$HDI = \sum_{i=1}^{n} \alpha_1 HDI_{t-i} + \sum_{i=1}^{n} \emptyset EG_{t-1} + \varepsilon 1$$

$$LE = \sum_{i=1}^{n} \alpha_1 HDI_{t-i} + \sum_{i=1}^{n} \emptyset EG_{t-1} + \varepsilon 1$$

$$AYS = \sum_{i=1}^{n} \alpha_1 AYS_{t-i} + \sum_{i=1}^{n} \emptyset EG_{t-1} + \varepsilon 1$$

$$PCE = \sum_{i=1}^{n} \alpha_1 PCE_{t-i} + \sum_{i=1}^{n} \emptyset EG_{t-1} + \varepsilon 1$$

Description:
HDI = Human Development Index
LE = Life Expectancy
AYS = Average Years of Schooling
PCE = Per Capita Expenditure
EG = Economic Growth

International Journal of Economic Research and Financial Accounting

International Journal of Economic Research and financial Accounting (IJERFA)
Volume 4, Number 2, January 2026, Page. 296 - 304 E-ISSN: 2964-1977

t = Time Series 1,2,…. n
ε = error term

RESULTS AND DISCUSSION

Stationarity Test

To test stationarity in this study, a unit root test was used using the Augmented Dickey-Fuller (ADF) at the 5% level with a root test at the level. Economic variable data commonly used are time series or panel series data. Combined data between time series and cross-section data are generally stochastic/have a non-stationary trend, meaning the data has a unit root. Problems with time series or panel series data usually involve autocorrelation; this type of data will cause the data to be non-stationary. Non-stationary data leads to poor model estimation. To be able to estimate a model from the use of this data, the step that must be taken is the stationarity test or unit root test.

Table 1Stationarity Test Results

Variable	ADF	Prob
	Level	
GRDP	-10.47074	0.0000*
HDI	-3.131457	0.0256*
LE	-3.539996	0.0080*
AYS	-2.162892	0.2206
PCE	-3.826989	0.0031*
	1stdifference	
GRDP	-12.81458	0.0000
HDI	-16.89234	0.0000
LE	-16.18505	0.0000
AYS	-16.53817	0.0000
PCE	-16.23962	0.0000

Source: Eviews12 Data Processing Results, 2025

Description :
* :Sationer Data

The test results show that some data using the ADF test at the level level accept H0, which is a non-stationary condition. After testing at the difference level, all data using the ADF test at the 1st difference level reject H0, which is a variable probability value <0.05, meaning the data is stationary or does not contain a unit root.

Var Stability Test

Before proceeding to the next stage of analysis, it is essential to examine the stability of the VAR model. If the VAR estimates, together with the error correction component, are not stable, then the impulse response analysis and variance decomposition will not yield reliable results. The stability condition of the VAR model is assessed by evaluating the roots of its characteristic polynomial. A VAR model is considered stable when all roots have moduli that fall below the value of 1.

International Journal of Economic Research and Financial Accounting

International Journal of Economic Research and financial Accounting (IJERFA)
Volume 4, Number 2, January 2026, Page. 296 - 304 E-ISSN: 2964-1977

Table 3. Data Stability Test

Root	Modulus
-0.380204	0.380204
-0.284557	0.284557
0.041790 – 0.105938i	0.113883
0.041790 + 0.105938i	0.113883
-0.024299	0.024299

Source: Eviews12 Data Processing Results, 2025

Based on the test results above, it can be concluded that all the moduli of all the roots are below one (1), so the resulting system is stable.

Granger Causality Tes

The aim of the Granger causality test carried out on the variables involved in this study is to determine how strong the causal relationship is between these variables.

Table 4. Granger Causality Test

Lag 7	EG	HDI	LE	AYS	PCE
EG		6.E-06 ↔	0.0002 ↔	0.0006 ↔	2.E-05 ↔
HDI	0.0007 ↔		0.9995 O	0.6719 O	0.9079 O
LE	0.1755 →	0.9726 O		0.7733 O	0.9899 O
AYS	0.0032 ↔	0.7316 O	0.9978 O		0.8030 O
PCE	0.0009 ↔	0.6099 O	0.8736 O	0.4342 O	

Source: Eviews12 Data Processing Results, 2025

Description:
↔: Two-way relationship
→:One-way relationship
O : No relationship
Causality is said to occur if the probability value < 5% (0,05)

1) Relationship between HDI and GRDP

Based on the causality test with lag 7, the test results indicate a reciprocal relationship (Two-Way Causality) between the HDI and EG, because the probability values in both directions of the relationship are smaller than the 5 percent significance level (0.0007 < 0.05 and 6.E-06 < 0.05). This finding indicates that the quality of human development in the previous seven periods has been a driver of increased Economic Growth, and conversely, regional economic development also supports the increase in the HDI.

This two-way causal relationship demonstrates the existence of a Virtuous Cycle between human development and economic development, as described by Ranis and Stewart (2000). Over

International Journal of Economic Research and Financial Accounting

International Journal of Economic Research and financial Accounting (IJERFA)
Volume 4, Number 2, January 2026, Page. 296 - 304 E-ISSN: 2964-1977

a seven-year period, human capital and economic capacity mutually fuel progress. The 7.41% increase in Economic Growth in 2017 provided a strong fiscal base, reflected in a significant 3.69-point increase in the Human Development Index (from 68.46 to 72.15) in 2024. Conversely, the quality of human capital, as measured by the HDI (68.46 in 2017), serves as an anchor for regional economic resilience. This quality is crucial to ensuring EG remains positive at 4.24% in 2024, despite experiencing a sharp contraction in 2021. This aligns with AmartyaSen's (1999) view that human development is not merely an end in itself but also a productive tool that ensures long-term economic stability and recovery. This condition is consistent with the findings of Ja'far (2025)who also proved the existence of two-way causality between the Human Development Index and Economic Growth in Indonesia, also in line with the research of Abda & Cahyono(2022)which showed a mutually reinforcing relationship between the two variables.

2) Relationship between AHH and GRDP

Based on the causality test with lag 7, the test results indicate a one-way causal relationship from Economic Growth to Life Expectancy. LE does not affect EG because the probability value of 0.1755 is greater than the 5 percent significance level. However, in the reverse relationship, EG has a significant effect on LE with a probability of 0.0002. This means that increasing life expectancy is not a factor that drives economic growth, but rather economic growth provides health facilities and infrastructure that enable life expectancy to increase.

This unidirectional causality reinforces Grossman's (1972) Health Capital Theory, which emphasizes that improvements in health are a function of economically funded investments. With a lag of 7, Life Expectancy in 2024 is a lagged outcome of Regional Income in 2017. The high level of longevity (7.41%) in 2017 prompted the regional government to allocate substantial resources to health, sanitation, and basic nutrition programs. Because increased longevity is a structural process, the full impact of these investments is not realized until seven years later. This is evidenced by the increase in LE of 1.45 years (from 68.68 years to 70.13 years) in 2024. This finding is also supported by Preston's (1975) study linking per capita income (a proxy for EG) with increases in life expectancy. The absence of causality between LE and EG with a lag of 7 suggests that while health is a benefit of wealth, the economic returns from longevity require a longer period than seven years to manifest as a driver of growth. Furthermore, this finding is also in line with Akinwale(2021)research which shows that economic growth has a positive relationship with increasing life expectancy in resource-rich developing countries.

3) The Relationship between Average Years of Schooling and GRDP

Based on a causality test with a lag of 7, the test indicates a two-way causal relationship between AYS and EG. AYS influences EG with a probability of 0.0032, and conversely, EG has a significant effect on AYS with a probability of 0.0006. This finding suggests that changes in AYS over the previous seven periods were able to drive economic growth, and at the same time, economic growth played a significant role in increasing AYS.

This two-way relationship aligns with Endogenous Growth Theory (Lucas, 1988), which views education as a key productive asset. The accumulated Average Years of Schooling of 7.60 years in 2017 produces a workforce with higher skills. The quality of this human capital is a key factor in enabling EG to remain positive (4.24%) in 2024, even after the crisis. This contribution aligns with the findings of Barro (1991), who identified initial education level as a strong predictor of economic growth. Conversely, the EG performance of 7.41% in 2017 creates better job prospects, reduces the opportunity cost of education, and motivates family investment. This ensures that AYS will continue to increase significantly by 0.92 years (from 7.60 years to 8.52

International Journal of Economic Research and Financial Accounting

International Journal of Economic Research and financial Accounting (IJERFA)
Volume 4, Number 2, January 2026, Page. 296 - 304 E-ISSN: 2964-1977

years) in 2024, ensuring a sustainable supply of human capital in the future. Furthermore, this finding is also in line with a study byArifin et al., (2023), which shows that GRDP significantly influences AYS across provinces in Indonesia.

4) Relationship between Per Capita Expenditure and GRDP

Based on the causality test with lag 7, the test results indicate a very strong reciprocal relationship (Two-Way Causality) between PCE and EG, because the probability values in both directions of the relationship are much smaller than the 5 percent significance level (0.0009 < 0.05 and 2.E-05 < 0.05). This means that Per Capita Expenditure in the previous seven periods was the main driver of Economic Growth, and conversely, Economic Growth significantly increased the Per Capita Expenditure of the community.

This two-way causality reflects the dynamics of aggregate demand. The high Per Capita Expenditure in 2017 (of 10.14 million) created a stable domestic market. This solid consumption serves as a buffer that supports output and keeps the EG positive (4.24%) in 2024. This principle aligns with Keynes's emphasis on the role of demand in determining economic output. Conversely, the 7.41% PE in 2017 is a source of real income growth, reflected in the PCE increase of 1.54 million (reaching 11.68 million) in 2024. This steady increase in purchasing power, which is the result of the previous seven years of growth, ensures the continuity of demand needed to maintain the current EG growth rate. Research by Widiaty & Nugroho(2020) also confirms that economic growth plays a crucial role in influencing increases in per capita expenditure across various regions.

VECM test results

The VECM estimation results are used to test the long-term and short-term effects of the dependent variable on the independent variable. If the t-statistic is positive and greater than the positive t-table, a long-term and short-term relationship can be concluded. If the t-statistic is negative and greater than the negative t-table, a long-term and short-term relationship can be concluded.

Tabel 3. VECM Test

Long Term Relationship		
Variable	Coefficient	**t-statistic**
HDI	-9.411150	**-3.27684**
LE	3.549368	**2.15593**
AYS	18.01207	**3.09156**
PCE	0.006562	**3.25705**
Short Term Relationship		
Variable	Coefficient	**t-statistic**
Cointegration	-1.036441	**-2.17212**
HDI	0.657394	**1.67102**
LE	0.141188	**0.89611**
AYS	0.167332	**1.41620**
PCE	105.0053	**0.59400**

Source: Eviews12 Data Processing Results, 2025

International Journal of Economic Research and Financial Accounting

International Journal of Economic Research and financial Accounting (IJERFA)
Volume 4, Number 2, January 2026, Page. 296 - 304 **E-ISSN: *2964-1977***

The Vector Error Correction Model (VECM) test results show that in the long run, there is a significant cointegration relationship between Economic Growth and all human quality variables, namely the Human Development Index (HDI), Life Expectancy (LE), Average Years of Schooling (AYS), and Per Capita Expenditure (PCE). The existence of this cointegration proves that these variables move together towards equilibrium over a very long period of time, confirming the role of Human Capital as the foundation of sustainable economic development. Meanwhile, short-term analysis (through the Error Correction Term/ECT) shows that only Economic Growth (EG) acts as an adjustment variable. With a significant ECT coefficient of -1.036441, PE has a very fast correction ability (103.64% per period) to correct system deviations back to long-term equilibrium, while other human quality variables do not show significant adjustments in the short run. This finding indicates that Economic Growth plays a major role in responding to and stabilizing the dynamics of relationships between variables in the study area.

CONCLUSION

The results show that Economic Growth (EG) in South Sulawesi is influenced by the development of human development variables at lag 7. The Human Development Index (HDI) has a bidirectional causal relationship with EG, indicating that the quality of human development in the previous seven years drives economic growth, and past economic growth also increases the HDI. LE has no significant effect on EG, but EG in the previous seven years significantly influences the increase in LE. The RLS (Regression Based Learning) shows a bidirectional causal relationship with EG, indicating that improvements in education and past economic development mutually reinforce each other. PCE has no significant effect in the short term, but in the long term, at lag 7, PCE and EG significantly influence each other.

Overall, these results confirm that economic growth is the accumulation of developments in human development, health, education, and purchasing power over the previous seven years. Long-term cointegration among all variables indicates that investment in human development is a critical foundation for sustainable economic growth in South Sulawesi.

REFERENCES

Abda, S. A., & Cahyono, H. (2022). Apakah IPM, Pengangguran, Dan Pendapatan Perempuan Berpengaruh Dalam Menurunkan Kemiskinan di Kota Surabaya? *Independent Journal of Economics*, *2*(1). https://doi.org/https://doi.org/10.26740/independent.v2i1.43769

Akinwale, Y. O. (2021). Health Expenditure, Economic Growth and Life Expectancy at Birth in Resource Rich Developing Countries: A case of Saudi Arabia and Nigeria. *Journal of Economic Cooperation & Development*, *42*(2).

Arifin, H., Hinelo, R., Bahsoan, A., Hafid, R., & Sudirman, S. (2023). Pengaruh Tingkat Pendidikan Terhadap Pertumbuhan Ekonomi di Kota Gorontalo. *Journal of Economic and Business Education*, *1*(2). https://doi.org/https://doi.org/10.37479/jebe.v1i2.19204

International Journal of Economic Research and Financial Accounting

International Journal of Economic Research and financial Accounting (IJERFA)
Volume 4, Number 2, January 2026, Page. 296 - 304 **E-ISSN: *2964-1977***

Azwardi, & Sukanto. (2024). Keterkaitan Indeks Pembangunan Manusia dengan Pencapaian Tujuan Pembangunan Berkelanjutan di Indonesia. *Jurnal Pembangunan Berkelanjutan*, *10*(1), 45–60.

BAPPENAS. (2020). *Teknis Penyusunan Rencana Aksi-Edisi II Tujuan Pembangunan Berkelanjutan (TPB)/ Sustainable Development Goals (SDGs)*.

Ja'far, A. M. (2025). *Analisis kausalitas dan kointegrasi antara zakat, pertumbuhan ekonomi, indeks pembangunan manusia dan kemiskinan di Indonesia* [Universitas Islam Negeri Maulana Malik Ibrahim]. http://etheses.uin-malang.ac.id/78666/

Nurjannah, S., Sari, D. ., & Hidayat, T. (2023). Hubungan timbal balik antara pembangunan manusia dan pertumbuhan ekonomi: Studi empiris di Indonesia. *Jurnal Ekonomi Dan Pembangunan*, *21*(2), 123–135.

Nurma, A. (2025). Pengaruh Indeks Pembangunan Manusia (IPM), Pengangguran, Dan Pertumbuhan Ekonomi Terhadap Kemiskinan Di Sulawesi Selatan. *Jurnal Studi Inovasi Ilmu Ekonomi*, *1*(1).

Pratiwi, N., Dianta, K., & Nikensari, S. I. (2024). Analisis Potensi Sektor Ekonomi Unggulan Kota Makassar Sebagai Kota Metropolitan Baru di Kawasan Timur Indonesia. *ECo-Fin*, *6*(2). https://doi.org/https://doi.org/10.32877/ef.v6i2.1405

Ringga, A., & Silvia, R. (2024). Analisis Disparitas Indeks Pembangunan Manusia Antar Kabupaten/Kota di Provinsi Sulawesi Selatan. *Jurnal Pembangunan Daerah*, *12*(1), 45–58.

Shantika, R. D., & Sunoto, S. (2025). The Influence of Human Development Index, Unemployment and Population on Poverty Rate in Sulawesi Island in 2013-2022. *Formosa Journal of Multidisciplinary Research*, *4*(5). https://doi.org/https://doi.org/10.55927/fjmr.v4i5.184

Widiaty, E., & Nugroho, A. P. (2020). Pertumbuhan Ekonomi Indonesia Perspektif Ekonomi Islam: Peran Inflasi, Pengeluaran Pemerintah, Hutang Luar Negeri dan Pembiayaan Syariah. *Jurnal Ilmiah Ekonomi Islam*, *6*(2). https://doi.org/https://doi.org/10.29040/jiei.v6i2.1043